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ABSTRACT

This study hypothesized that recent experience with a set of words is a strong influence on selecting words in an appropriate context where other lexical items are equally available for selection, i.e., recency training should significantly increase the probability of occurrence of words chosen to fill gaps in structured sentences. Two experiments were conducted testing the hypothesis. No single result from either test unambiguously supported the hypothesis, but the many near-significant or significant trends in expected directions lent support to the hypothesis. Stronger recency effects than those observed were expected, but the authors suggest that the recency experience provided may not have been sufficiently long or intense enough to produce these effects, so alternative recency training procedures are being contemplated. (Author/DI)

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Linguistic performance can be examined from either of two orientations--an investigation of variables influencing a person's processing of linguisitic input, or of the person's linguistic output itself. A large number of studies have investigated the listener's processing of sentential input (e.g., Johnson, 1965; Fodor & Bever, 1965; Garrett, Bever, & Fodor, 1966; Rohrmann, 1968; Sachs, 1967) but few have examined factors impinging on a person's performance in writing or speech independent of those which reflect the person's processing of the input.

The transformational-generative revolution in theoretical linguistics has provided theorists with a model that effectively represents an ideal speaker-listener's internalized linguistic competence. Such a competence model, however, is inappropriate to the study of the performance characteristics of individual speakers (Chomsky, 1965). For example, given this deep string:

I hate it (I go)

either one of the following grammatical and acceptable surface strings may be generated by a transformational grammar, depending on the transformations applied:

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[1]Paper presented at the annual meeting of the American Educational Research Association, Chicago, Illinois, April, 1972.

[2]Experiment 1 was completed by the first author under the supervision of Dr. Joan Prentice. The authors would like to thank Dr. Prentice for her assistance and encouragement.

(a) I hate going.

(b) I hate to go.

The transformational grammar as a model of linguistic competence, however, is unable to predict the probabilities of occurrence of either Sentence (a) or (b). A competence model is a descriptive representation of a speaker-listener's language capabilities and does not predict in any way the person's actual linguistic behavior. What is needed, of course, is a model of performance, one which can predict various probabilities of language behavior given a particular performance context.

With regard to the lexicon, Prentice (1968b) has posited that selection of lexical items from a set of available alternatives is a function of (a) intraverbal context, (b) frequency of occurrence in S's history, (c) recency of occurrence in S's history, and (d) precision of semantic requirements. Intraverbal context refers to the linguistic demands of an utterance; that is, a word must have lexical features that coincide with its markers in the deep structure. For example, selection of a word having the following features

+N

+concrete

+human

+masculine

must be made from among the items "man," "boy," "firemen," and "actor," among others, and would not include the items "mistress," "handsome," "quickly," or "with." Rosenberg (1966, 1968, 1972) and Brentice (1968a) have demonstrated the role of intraverbal association in word choice.

The frequency with which a speaker has encountered a lexical item in his history is also presumed to influence his use of the item. At one extreme, the speaker's total lack of receptive or productive experience with a word is perfectly correlated with the word's total lack of occurrence in his speech. Although it is presumptuous to postulate the other extreme, that the frequency of occurrence of a word in a person's history is perfectly coincident with its frequency of response in the person's speech, Prentice (1968b) demonstrated that high-frequency words in the spontaneous speech of her Ss occurred significantly more often than low-frequency words.

Brown (1968), on the other hand, has argued that word frequency is not a reliable predictor in certain situations. He pointed out that when pineapples are being named, the word "pineapple" would have a higher frequency of occurrence than the word "fruit," despite the fact that the latter has a higher rated frequency in counts of general usage. Prentice (1968b) accounted for this event in positing that the precision of semantic requirements is also a potent factor influencing word choice. The speaker thus is seen to select words in consideration of the degree of precision he requires in communicating the meaning of his message. (See Olson, 1970, for an elaboration.)

The fourth influence on lexical choice was identified by Prentice (1968b) as recency of occurrence in the Ss history. The more recent a speaker-listener's experience with a word, the more likely he is to employ the word in his speech. In her study, Prentice (1968b) was unable to show recency effects. The present studies were undertaken to isolate the effects of recency training on lexical choice.

The intraverbal context, frequency of occurrence, and precision of semantic requirements were controlled. All Ss were exposed to the same semantic requirements under the same context conditions, with words that were controlled for frequency of occurrence using normative data generated by the first part of this study.

It is hypothesized that recent experience with a set of words is a potent influence on the selection of words in an appropriate context where other lexical items are equally available for selection. That is, recency training should significantly increase the probability of occurrence of words chosen to fill gaps in structured sentences.

EXPERIMENT I

Method

Materials. Twenty pages from The Teacher's Word Book of 30,000 Words (Thorndike & Lorge, 1944) were randomly selected. One high frequency (AA) word from each page was randomly chosen. If, however, the rated frequency of the noun was judged to have decreased in current usage, another page and word were chosen. For example, the word crinoline has a Thorndike-Lorge frequency rating of AA but is rarely encountered in contemporary writing and speech and was therefore discarded.

A parallel list of 20 words was formed by selecting another AA word (again using the same selection restriction based on current usage), conforming to one of the following features: synonymity

(e.g., city was paired with town), or antonymity (e.g., night and day), or functional equivalence (e.g., hair and eyes).

A rating task was prepared in two forms (Form F and Form G) to comprise the recency training administered to the two groups of Ss. Form F consisted of one member from each of the 20 word pairs described above, and Form G the other member, randomly assigned. (Later, however, two of the word pairs were discarded due to the difficulty encountered in writing completion sentences that were judged to be able to elicit either of the members in a pair with equal probability. Forms F and G, therefore, were comprised of 18 words each.)

One completion type sentence was written for each pair of words, such that either of the words in a pair was able to be substituted for the other in the written context and make no difference in either the acceptability or grammaticality of the completed sentence. The sentences were designed to enhance the probability of occurrence of either of the words in the designated place in the sentence and at the same time to attenuate the probability of occurrence of all other possible words. Twelve distractor sentences were written which were judged not to easily elicit any of the words in either Form F or Form G. Randomly ordered, the 30 sentences served as the set of experimental materials.

Procedure. Recency training on either Form F or G was given to two groups of Ss, who were told that norms were being established for concreteness/abstractness and positive/neutral/negative connotations of the selected words. The Ss were given one of the forms at random and were asked to rate each of the words on the two dimensions. This

dummy task was the recency training trial.

Immediately after each S completed the recency training, he was given the actual experimental materials. To prevent Ss from making any obvious connections between words on the dummy task and word choices on the experimental task, the Ss were asked to participate in a second "mini-experiment" which would help provide guidelines for improvement of sentence- completion items on teacher-constructed examinations. The Ss were given the 30 sentences, each with one deleted word, and were asked to supply words which adequately completed the sense of the sentence. The Ss were instructed to write the first acceptable word that occurred to them, rather than spend much time deliberating, and to check their protocols after completion to insure that one and only one word had been written in each blank.

Subjects. The Ss for Experiment I were 13 undergraduates in an educational psychology class taught by the first author, three instructional associates in educational psychology, and three employees in the Interlibrary Loan Office of the Indiana University Library. The Ss were assigned to the two treatment groups randomly, in a group testing situation. Participation was voluntary.

Results. The dependent variable was a difference score, $X = R - NR$, where R = the number of words the S encountered on the recency list and which the S chose to complete the target sentences, and NR = the number of words from the parallel form of the recency list (that

is, the non-recency list to which the Ss were not exposed) and which were chosen to complete the target sentences. Table 1 presents these data.

Analysis of variance was performed on the difference scores. It should be noted that the critical analysis focused on the grand mean (H_0: $\mu \doteq 0$). If $\mu = 0$, the choice of words from one list or the other, regardless of experience, would be attributable to chance with the result that the mean of the difference scores would not differ significantly from zero. It was found that, indeed, $\mu \neq 0$ ($F = 6.24$, $df = 1,17$, $p < .05$).

The difference between materials was also significant ($F = 5.47$, $df = 1,17$, $p < .05$). The reliably stronger effect is attributable to Form G words ($\bar{X} = 3.55$) which produced a greater effect in favor of recency training than Form F ($\bar{X} = 0.2$). This significant materials effect indicates that despite the fact that words were randomly assigned to forms, Form G words may have been more probable than were Form F words. Without some estimate of the a priori probabilities associated with each choice, it is difficult to determine whether the observed effects were due to recency experience or to pre-experimental differences. A control group which had recent experience with neither R or NR words is needed. Such a control group was included in Experiment II. Attempts were also made to reduce the number of "other" words which were given to experimental sentences since large variability in these words might invalidate the difference score analysis (see Experiment II for a discussion of this.) Finally, attempts were made to equate the two lists of words by gathering normative information concerning the probabilities of word choice for a given sentence.

Table 1

Raw Frequencies, Means and Variances on Recency (R), Non-recency (NR), and Other (O) Words for Groups F and G.

	Group F (N=10)				Group G (N=9)		
	R	NR	O		R	NR	O
S-1	6	6	6	S-1	8	6	4
S-2	7	6	5	S-2	6	7	5
S-3	4	10	4	S-3	11	4	3
S-4	7	6	5	S-4	7	3	8
S-5	6	6	6	S-5	10	3	5
S-6	8	7	3	S-6	6	5	7
S-7	5	9	4	S-7	8	6	4
S-8	7	6	5	S-8	9	4	5
S-9	7	6	5	S-9	10	5	3
S-10	11	4	3				
$\bar{X}$	6.8	6.6	4.6		8.33	4.78	4.89
S^2	3.3	2.9	1.2		3.25	2.0	2.9

Experiment II

Method

Materials. Three pools of sentences were constructed for the sentence completion task to be used in this experiment. Form 1 consisted of 50 seven-word sentences drawn from a pool of sentences utilized by Cunningham (1972) in a study investigating imagery in sentence learning. On the basis of normative data supplied in that study, 25 of the sentences were concrete (rated high in image arousing value) and 25 were abstract (rated low in image arousing value). All sentences were simple, active, affirmative, declarative sentences of the form: DET ADJ N V_{past} DET ADJ N with the last three lexical items functioning in all sentences as the deep object of the base string. Nouns were randomly deleted from the deep object position in half of the sentences and from the deep subject position in the other half. Form 2 consisted of the same sentences as Form 1 but with noun and object deletions reversed. Form 3 contained 30 sentences with varying structures and locations of noun deletions, many of which were taken from the expermental materials of Experiment I. Sentences in Form 3 were written so as to limit, in the Es' judgment, the alternatives for a suitable completion to two equally plausible alternatives.

Forms 1, 2, and 3 were randomly ordered and administered to a group of Ss for norming purposes. The Ss were requested to write in each blank any word which adequately completed the sense of the sentence. The Ss were told that they were to write the first acceptable word that occurred to them, rather than spend much time deliberating,

and to check their protocols after completion to insure that one and only one word had been placed in each blank.

A FORTRAN computer program designed to provide frequency counts of verbal data was modified to allow for the punching of six words per data card instead of one each, as required by the original LISTA program written by Veldman (1967). The modified program, called VLIST, was used to analyze the data obtained from the three groups of normative Ss.

On the basis of this analysis, materials were prepared for the recency training and the experimental sentence completion tasks. Twenty sentences which elicited two words in equal or nearly equal probabilities were chosen. All of these sentences were taken from Form 3 since the analysis revealed that Forms 1 and 2 had elicited responses with marked variability demonstrating lack of agreement among the normative Ss. Each word in the pair was randomly assigned to one of two parallel recency training lists, Form J and Form K. A control list, Form L, contained 20 words having little or no probability of being selected to complete any of the test sentences. Fifteen distractor sentences that did not have a high probability of eliciting any of the words in either Form J, K, or L were added to the pool of sentences. These 35 sentences, all with noun deletions, were randomly ordered and presented to all Ss immediately after recency training.

Procedure. Either the Form J (N=17), Form K (N=17), or Form L (N=15) list was randomly given to each of the experimental Ss, who was asked to rate each of the 20 words on his list according to the extent to

which he was able to form a mental image of the referent of the word. Ratings were in unit increments from 1 to 7, with two anchor points provided: 1 denoted a referent that was "Difficult to Image" and 7 denoted a referent that was "Easy to Image." The covert purpose of this task, unrevealed to the Ss, was to provide recency training with one of the three sets of words directly relevant to the experimental task to follow.

Immediately after all Ss had completed the ratings, they were then ostensibly requested to participate in a second experiment for another experimenter, leading the Ss to believe that the two parts of the experiment were in fact two separate and discrete experiments. Comments from the Ss on a follow-up questionnaire indicated that no overt connections had been drawn by the Ss between the two parts. The lack of an identifiable relationship was crucial to the outcome, since recency effects may have been seriously confounded otherwise.

Subjects. The normative Ss were 45 undergraduate students in two classes of introductory educational psychology at Indiana University during the summer of 1971. The experimental Ss were 49 undergraduate students in two other classes during the same academic session. No student participated in both the norming and experimental tasks. Participation was voluntary. The study was run during the regular classroom periods.

Results. The dependent variable used in these analyses requires some explanation. As in Experiment I, Ss' responses were sorted into three categories: recency words (those words on which recency training was provided for one of the experimental groups, e.g., Form J words

for experimental Group J or Form K words for experimental Group K), non-recency words (words from the parallel recency list on which no recency training was provided, e.g., Form K words for experimental Group J and Form J words for experimental Group K) and "other" words (words from Form L or from any other source which were used by the S to complete an experimental sentence). These three categories of words will be labelled R, NR, and O respectively.

Table 2 shows the frequency of R, NR, and O words for Group J and for Group L (scored with Form J words as R words) while Table 3 shows these same data for Group K and Group L (scored with Form K words as R words). Means and variances for these measures are also presented. It had been expected from the normative data that most Ss would choose either R or NR words to complete experimental sentences. But overall, one out of every four words given was an O word and, moreover, there was considerable variance associated with generating O words. In fact, means and variances are nearly equal for O words for all groups. This variability seems to have consequences for the data analysis.

When one compares the number of R words used to complete experimental sentences for Groups J and L and for Groups K and L, no significant differences are revealed on either comparison. Thus, there is no significant tendency for recency training to increase the number of R words given to experimental sentences. However, there is a significant effect of recency training to decrease the number of NR words given to experimental sentences (for the Group K - Group L

comparison, t (30) = 1.43, $p < .10$, 1 tail test; for the Group J - Group L comparison, t (30) = 2.58, $p < .01$, 1 tail test). At first glance, this finding seems to indicate that the effect of recency training was to inhibit NR responses rather than to increase the likelihood of R responses as had been expected. It is argued here, however, that the high variability associated with O responses has confounded the NR and R measures and that this variability needs to be removed from an individual S's score.

Accordingly, a ratio score was devised and used as the primary dependent variable. Ss' scores (X) were computed using the following formula.

$$X = \frac{R}{R + NR}$$

Thus, S-1 in Table 2 would have a ratio score of $8/(8 + 6)$ or .571. In effect this measure allows a comparison of the proportion of R word responses that occurred when either an R or NR word occurred (and only when an R or NR word occurred) in both the experimental and the control group. Since the primary interest of this study was in the relative frequency of occurrence of two equally likely alternatives with and without recency training and not in individual differences in word production, it was felt that the use of such a score was justified. The ratio score should avoid some of the difficulties associated with a simple difference score.

Using this score (and this definition of recency, incidentally) significant ($p < .10$, 1 tail test) recency effects are observed in both Group J and Group K when compared with Group L. (Group J, t (30) = 1.66; Group K, t (30) = 1.53).

Table 2

Raw Frequencies, Means and Variances on Recency (R), Non-recency (NR), and Other (O) Words for Groups J and L

	Group J (N=17)				Group L (N=15)		
	R	NR	O		R	NR	O
S-1	8	6	6	S-1	6	5	9
S-2	8	7	5	S-2	8	9	3
S-3	14	4	2	S-3	6	6	8
S-4	9	6	5	S-4	7	9	4
S-5	8	7	5	S-5	8	8	4
S-6	7	7	6	S-6	7	6	7
S-7	7	6	7	S-7	4	10	6
S-8	8	9	3	S-8	9	9	2
S-9	10	7	3	S-9	6	10	4
S-10	4	7	9	S-10	6	9	5
S-11	10	5	5	S-11	12	5	3
S-12	8	7	5	S-12	7	9	4
S-13	5	6	9	S-13	8	10	2
S-14	8	8	4	S-14	8	8	4
S-15	9	8	3	S-15	7	9	4
S-16	11	5	4				
S-17	3	9	8				
$\bar{X}$	8.06	6.71	5.24		7.27	8.13	4.60
s^2	6.68	1.73	4.31		3.21	3.12	4.26

Table 3

Raw Frequencies, Means and Variances on Recency (R), Non-recency (NR), and Other (O) Words for Groups K and L

	Group K (N=17)				Group L (N=15)		
	R	NR	O		R	NR	O
S-1	10	7	3	S-1	5	6	9
S-2	12	6	2	S-2	9	8	3
S-3	13	4	3	S-3	6	6	8
S-4	6	5	9	S-4	9	7	4
S-5	10	6	4	S-5	8	8	4
S-6	8	8	4	S-6	6	-	7
S-7	8	6	6	S-7	10	4	6
S-8	7	8	5	S-8	9	9	2
S-9	6	10	4	S-9	10	6	4
S-10	9	7	4	S-10	9	6	5
S-11	9	8	3	S-11	5	12	3
S-12	10	4	6	S-12	9	7	4
S-13	6	5	9	S-13	10	8	2
S-14	11	6	3	S-14	8	8	4
S-15	10	7	3	S-15	9	7	4
S-16	8	7	5				
S-17	7	5	8				
$\bar{X}$	8.82	6.41	4.76		8.13	7.27	4.60
s^2	4.41	2.51	4.69		3.12	3.21	4.26

Discussion

The two experiments reported here offer some support that recency plays a role in word choice in language production. Experiment I represented an initial attempt to investigate recency as a factor in word choice and this experiment did reveal differences between two groups given differential recency experiences. Those data were ambiguous with respect to the extent and source of the differences between groups, however, so certain improvements in design and analysis were made and incorporated into Experiment II. The data from Experiment II also indicated that recency may play a role in word choice but once again the data are somewhat ambiguous. "Recency" effects were shown by a decrease in the number of NR words rather than by an increase in the number of R words. A ratio score devised to eliminate the confounding effects of O words similiarly showed recency effects but the differences were not great.

Taken together these experiments lend credence to the hypothesis that recent experience with a word will influence its probability of occurrence in later contexts. No single result points unambiguously to this conclusion but the multiplicity of nearly significant or significant trends in expected directions lends support to the hypothesis. We had expected stronger recency effects than those observed but it is likely that the recency experience provided was not of sufficient duration or intensity to produce such strong effects. Alternative recency training procedures are being contemplated.

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